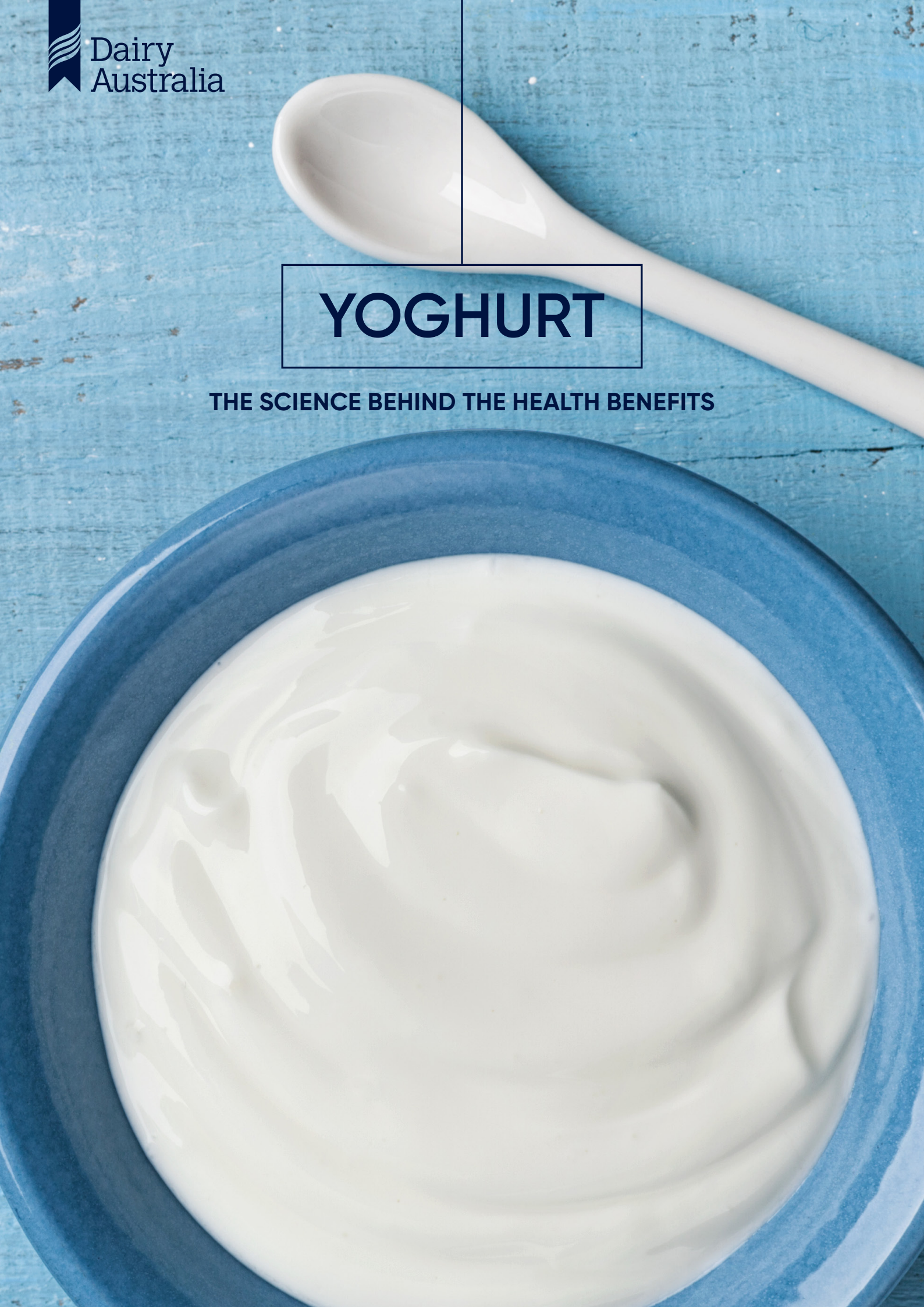
Dairy Australia

YOGHURT

THE SCIENCE BEHIND THE HEALTH BENEFITS



YOGHURT AT A GLANCE

YOGHURT MEAN INTAKE

24.7g
2–18 years

23.5g
19–50 years

ONE SERVE OF YOGHURT =

200
grams

ONLY

16%
of the Australian population consume yoghurt

FLAVOURED YOGHURT IS JUST AS NUTRITIOUS AS PLAIN YOGHURT

In the 2011–12 Australian Health Survey,

YOGHURT ONLY CONTRIBUTED

1.8%
to free sugars intake.

DISCRETIONARY FOODS CONTRIBUTED

81%
to free sugars intake.

Consumption of yoghurt is associated with:

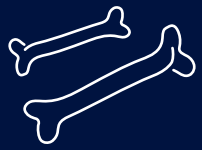
IMPROVED DIET QUALITY

DECREASED RISK OF DIABETES

HEART HEALTH

HEALTHY WEIGHT

GUT HEALTH



REDUCED RISK OF FRACTURES

Studies make **no distinction** between the heath benefits of flavoured or plain yoghurt, but consistently show favourable associations between yoghurt and positive health outcomes.

Yoghurt is a nutrient-rich food that is included in food-based dietary guidelines across the world.[1-3] Dairy foods, including yoghurt play a role in supporting optimal bone health, as well as reducing risk of heart disease, stroke, hypertension and type 2 diabetes.[1] Unfortunately, our nation's most recent health survey revealed that most Australians are missing out on dairy benefits, with only one in 10 people over the age of two years eating enough dairy for optimal health. The average intake of dairy foods is only 1.5 serves per day, which is well below the minimum recommended intake for all population groups.[4]

Dairy foods are the number one source of calcium in the diet[5], however low intakes mean Australians are not meeting recommended intakes of this critical nutrient and putting their bone health at risk.[6,7]

The 2011-2012 Australian Health Survey revealed only 16 per cent of Australians consumed yoghurt on the day of the survey, which accounted for 7.8 per cent of total dairy intake and provided slightly less than five per cent of total calcium intake of survey respondents.[5] These figures highlight an opportunity to increase yoghurt consumption as a way of meeting daily dairy recommendations.

Yoghurt is often labelled a 'superfood' for its nutrient density and its role in promoting gut health due to its bacterial content. It also plays a role in weight management as a result of its high protein content impacting satiety and muscle mass. Despite these benefits, concerns have been raised about sugar content in flavoured varieties. However, both plain and flavoured yoghurt varieties have the same health benefits and are part of the five food groups that the Australian Dietary Guidelines recommend in the everyday diet of all Australians.[1]

Dairy Australia is the national services body for the dairy industry. This report, prepared by health professionals at Dairy Australia, aims to bring together the most up-to-date and emerging research around the health benefits of yoghurt. It draws from the latest evidence from around the globe to help health professionals and policymakers to understand the unique health benefits of this ancient fermented dairy food, and to encourage all Australians to enjoy plain and flavoured yoghurt varieties as part of a balanced diet.

WHAT IS YOGHURT?

Yoghurt is an ancient, traditional food that has been a part of the human diet for thousands of years. The word 'yoghurt' itself comes from Turkish, meaning 'curdled' or 'thickened milk', which is what happens to milk during yoghurt production.

Yoghurt is defined by Food Standards Australia New Zealand as "a fermented milk where the fermentation has been carried out with lactic acid producing microorganisms".[8] Yoghurt is made when a bacteria starter culture (most commonly lactobacillus and bifidobacterium) is added to pasteurised milk. Lactic acid is produced, which ferments and thickens the milk, creating the distinctive mouth-feel, acidity, taste and aroma of yoghurt. For a product to be labelled yoghurt it must also have a pH below 4.5, contain at least 10^6 cfu/g* microorganisms, and 3g/100g of protein.

There are a number of different yoghurts available in the Australian marketplace including Greek yoghurts, set yoghurts and stirred yoghurts. To offset its natural sourness, yoghurt can be flavoured with fruit purees, honey, sugar or other sweeteners (including sugar substitutes such as stevia). Some yoghurts may also contain added starch, cream, pectin or gelatin, which is added during production in order to enhance the thickness and creaminess of the end product.[9]

Australian yoghurt varieties

Set yoghurt: the mixture of milk and starter culture is poured into containers and incubated without any further stirring. The milk sets and has a characteristic thick texture.

Stirred yoghurt: the mixture of milk and starter culture is fermented in a large vat, and continuously stirred to create a creamy texture. Once the fermentation reaches the desired level, the yoghurt is pumped through a cooler to stop fermentation.

Greek yoghurt: a denser type of yoghurt that is made by straining whey from the yoghurt curd to give it a thicker and creamier consistency and a distinctive tangy taste.

Flavoured yoghurt: flavoured yoghurt could be a set, stirred or Greek yoghurt. Fruit or other sweeteners can be added as a base or stirred into the yoghurt mixture.

* cfu stands for colony forming units and refers to live bacterial cells that can multiply and grow into a colony

NUTRITION COMPOSITION

The nutrient composition of yoghurt is based on the milk from which it was derived[10] and can be altered through the source and type of milk, as well as the addition of ingredients such as fruit, sweeteners, stabilisers, colours, flavours, texturisers, and preservatives.[11]

Other factors that can influence yoghurt composition are the species and strains of the bacteria used for fermentation, the temperature and duration of the fermentation process, and storage time.[12] In addition, external environmental factors such as heat, acidic and alkaline settings can interrupt the integrity of the nutrients, modifying the final composition of yoghurt.[13]

As yoghurt is categorised as a nutrient-dense food, many health professionals suggest including yoghurt as part of a healthy diet.[14,15] When it comes to analysing the matrix of nutrients that yoghurt offers, it extends far beyond simply being calcium-rich. Regardless of whether yoghurt is plain or sweetened, all yoghurts provide a high amount of essential macro and micronutrients. 100g of strawberry flavoured yoghurt (regular fat), contains 172mg calcium, 17mg magnesium, 231mg potassium, 135mg phosphorous and 0.52mg zinc. In fact, the concentrations of these minerals are higher in yoghurt compared with milk by nearly 50 per cent.[16]

Yoghurt also contains smaller, but consistent amounts of other micro-nutrients including vitamin A, B12, riboflavin, niacin and iodine. Yoghurt is an excellent example of a whole food matrix, where the physical structure of the food delivering a combination of these nutrients as a whole, results in a greater health benefit than what could be achieved from consuming single isolated nutrients.[17,18]

NUTRIENT DENSITY OF YOGHURT

Calcium	343mg
Magnesium	33mg
Potassium	231mg
Phosphorous	270mg
Zinc	1.04mg

Calcium	214mg
Magnesium	20mg
Potassium	286mg
Phosphorous	182mg
Zinc	0.7mg

THE CONCENTRATIONS OF THESE MINERALS ARE HIGHER IN YOGHURT COMPARED WITH MILK BY NEARLY 50 PER CENT

FLAVOURED YOGHURT

The Australian yoghurt landscape

The 2011-12 Australian Health Survey showed 76 per cent of all yoghurt consumed in Australia was flavoured.[5] In 2018-19, plain varieties represented 51 per cent of total yoghurt sales, with sweetened varieties representing a smaller share at 28.7 per cent.◊ Consumption of plain varieties of yoghurt has increased by 39.6 per cent since 2012-13,[20] while sales of flavoured yoghurt decreased by 10.2 per cent. This trend may be driven by increasing consumer interest in added sugar, with 57 per cent of Australian adults agreeing that there is too much sugar in yoghurt.[21]

Yoghurt's contribution of sugar in the Australian diet

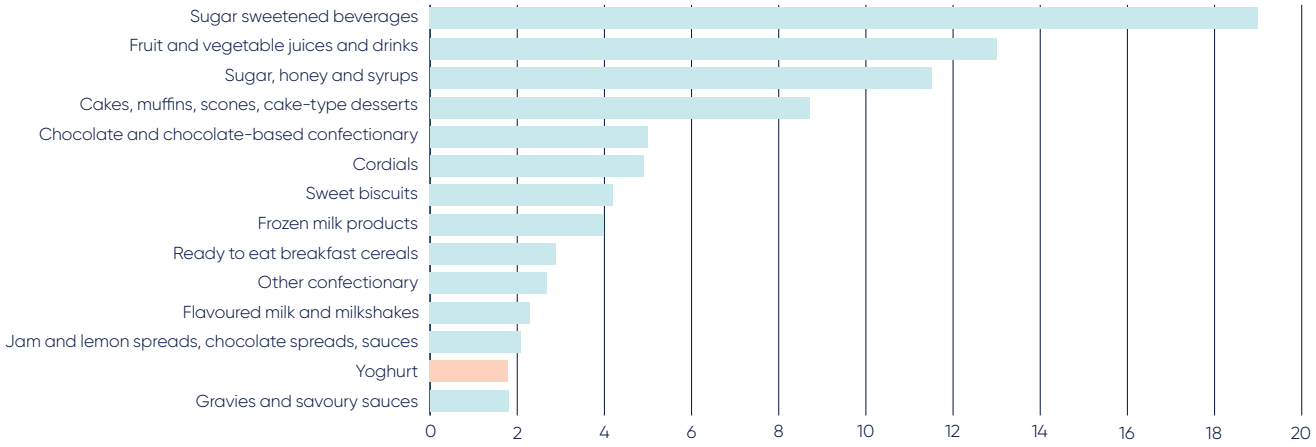
The 2011–12 Australian Health Survey showed Australians consumed an average of 60g of free sugars per day (or 14 teaspoons).† Discretionary foods contributed 81 per cent of free sugars and yoghurt provided as little as 1.8 per cent, as seen in Figure 1.[22]

Why add sugar to yoghurt?

In flavoured yoghurts, sugar and other sweeteners are not just added for the purpose of sweetening, but for a range of other functional properties. These include texture, viscosity and stabilisation.[23,24] Sugar in dairy foods has also been shown to increase consumption, particularly in children, adolescents and the elderly.[25-27] These are key age groups where sufficient calcium intake is a high priority to build and maintain peak bone mass. Yoghurt is a high calcium, nutrient dense food, and the addition of fruits, flavours and sugar may improve the aroma, texture, colour and flavour of the products.

The nutrient matrix of yoghurt is often overlooked and flavoured yoghurt may be perceived to act simply as a carrier of added sugars and have a negative impact on diet quality. In fact, the opposite has been demonstrated in a number of global studies where dairy foods such as flavoured yoghurt improved overall diet quality.[28–32] **A review of the evidence on sugar intakes and health outcomes commissioned by the NSW Ministry of Health found no evidence to suggest limiting nutritious foods in the diet that contain added sugar, such as flavoured yoghurt.**[33]

Figure 1 Various free sugar contributors to the Australian diet



† **Free sugars:** Added sugars and those found in honey and fruit juice
Intrinsic sugars: The sugar naturally found in foods like dairy, fruits and vegetables
◊ Using sales data in the absence of current nationally representative food intake data [22]

DID YOU KNOW?

There is an increasing number of no added sugar and reduced sugar yoghurt varieties in Australian supermarkets. Sugar replacements tend to be added in very small quantities and therefore do not contribute the same texture solids, making stabilisation more challenging. When sugar is reduced, total solids are also reduced which then need to be increased with either a filler, such as hydrocolloids, or an increase in existing ingredients.

ENERGY

In the 2011-12 Australian Health Survey, yoghurt intake only contributed an average of 90kJ to daily energy intake in Australians, which equates to one per cent of energy intake for an 8,700kJ average adult diet.[34] The mean daily energy intake from flavoured yoghurt was also very low at 64.9kJ. In contrast, muffins and cakes contributed an average of 300kJ to daily energy intake.

Yoghurt may play a role in reducing energy intake due to its low energy density, which can aid weight loss.[29] Yoghurt seems to be able to provide satiety (linked to protein content) and possibly decrease the urge to snack in between meals, thus lowering the overall daily energy intake.[35]

PROTEIN

Yoghurt is considered a high-quality protein with a full array and sufficient amounts of the essential amino acids that are required by the body.[36] The proteolytic bacteria activity (that occurs during fermentation) releases peptides and branched chain amino acids, specifically isoleucine, valine and leucine, which play an important role in protein synthesis and satiety and may assist with weight management.[35, 37, 38] Dairy sourced proteins have been proposed to assist calcium absorption[39] and play a role in the metabolism of muscle mass, thus improving muscle strength.[40]

FAT AND SATURATED FAT

The Heart Foundation has recently updated their position statement on dairy and have removed their restriction on full fat dairy products for the general population, as dairy fat appears to act differently on lipid metabolism compared to other dietary sources of saturated fat.[41] After reviewing all the available evidence, the Heart Foundation concluded that 'there is not enough evidence to recommend fat modification (i.e. full fat over reduced-fat products, or reduced-fat over full fat products) for the general population'.[42]

There is substantial scientific evidence to show that unlike saturated fat from other animal products, consumption of saturated fat from dairy foods such as yoghurt is not associated with the risk of heart disease.[43]

CALCIUM

When it comes to micronutrients like calcium, it's not only the amount found in foods that is important, but also the bioavailability. **Yoghurt, like other dairy products, is high in calcium that is easily absorbed in the gut[48], whereas calcium from other sources (e.g. legumes, nuts, vegetables), is not as easily absorbed due to the high content of fibre.**[49]

PLAIN YOGHURT (PER 100G)

	Plain Regular fat	Plain Reduced low-fat
Energy (kJ)	416	296
Protein (g)	5.2	7.6
Fat (g)	6.4	1.2
Saturated fat (g)	4.1	0.8
Carbohydrate (g)	5.7	6.9
Total sugar (g)	5.0	4.6
Lactose (g)	4.7	4.5
Free sugar (g)	0.0	0.0
Calcium (mg)	160	199

FLAVOURED YOGHURT (PER 100G)

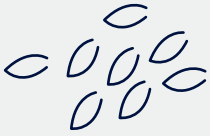
	Flavoured Regular fat	Flavoured Reduced low-fat
Energy (kJ)	509	306
Protein (g)	5.4	6.2
Fat (g)	5.2	1.5
Saturated fat (g)	3.3	1.0
Carbohydrate (g)	13.2	11.3
Total sugar (g)	11.6	9.4
Lactose (g)	4.7	4.5
Free sugar (g)	6.9	4.9
Calcium (mg)	153	176

Source: Internal analysis of all yoghurt varieties in Australian supermarkets. Data is based on average values across a number of brands, as sourced from product information labels or brand websites at a single point in time (September 2019). Values based on a range of yoghurts including Greek-style, organic, pot-set, no added sugar, lactose free and kids varieties.

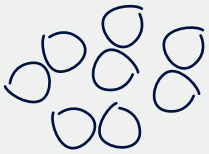
ONE SERVE = ¾ CUP

343mg
calcium

CALCIUM EQUIVALENTS (AMOUNT AND BIOAVAILABILITY)

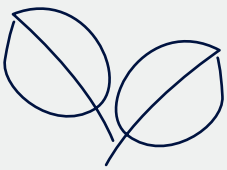


ALMONDS



CHICKPEAS

BROCCOLI



SPINACH

Bioavailable calcium absorbed
Sources 16, 19. All figures are approximate

CARBOHYDRATE

Yoghurt, like other dairy products, contains different types of carbohydrates including lactose, glucose, galactose and oligosaccharides. Lactose is broken down and used as an energy substrate by microorganisms present in yoghurt. The European Food Safety Authority (EFSA) published a document in 2010 that compiled a total of 14 studies, 13 of which showed that yoghurt consumption improves lactose digestion and alleviates the symptoms of lactose intolerance, indicating a cause-and-effect relationship between yoghurt consumption and improved lactose digestion.[44] This area of research is discussed further in the section on gut health and digestion.

SUGAR

Flavoured yoghurts may have added sugar to improve texture and taste and meet consumer demand for palatability. In a study comparing isovolumetric amounts (250g) of plain yogurt, plain yogurt with honey, strawberry yoghurt, skim milk and orange juice as mid-morning snacks on food intake, satiety, and glycemia, strawberry yoghurt was rated more palatable than plain yogurt and did not negatively impact glycemic response.[38]

The WHO suggests a healthy diet can include up to 10 per cent of total energy from added sugar.[92] This added sugar can be beneficial when consumed in a food product that is nutrient dense, such as yoghurt. A Dairy Australia analysis of 395 flavoured yoghurt products in the Australian marketplace found they had an average of 11g of total sugar per 100g. Considering yoghurt contains an average of 5g of intrinsic sugar (mainly lactose), only 6g of sugar on average is added, which equates to less than one and a half teaspoons of sugar per 100g.[46]

DID YOU KNOW?

All yoghurt types contain intrinsic sugar in the form of lactose, at about 5g per 100g of yoghurt[24], and according to the World Health Organisation (WHO), intrinsic sugars such as lactose that are inherent to dairy foods are not associated with adverse health implications.[92]

LOW-FAT

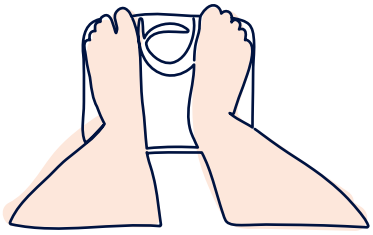
Public Health England compared low fat and regular-fat yoghurts to determine if there was any disparity in sugar content, as there is a general preconception that low fat yoghurt may contain increased added sugars to replace fat.[47] It was found that in 65 per cent of the comparisons made, the low or no-fat yoghurt had a lower sugar content than the full fat alternative. A further 18 per cent of reduced-fat options had the same sugar content. This highlights that only a minority of reduced-fat options have increased sugar content, and as can be seen from the most recent analysis of flavoured yoghurts in Australian supermarkets, on average, low fat flavoured yoghurts have less than one teaspoon of added sugar.

HEALTH BENEFITS

Diet quality

A recent study in Canada analysed the diets of over 20,000 consumers and **found yoghurt consumers had better diet quality, with higher daily intakes of several key nutrients including carbohydrates, fibre, riboflavin, vitamin C, folate, potassium, iron, magnesium, and calcium, when compared to yoghurt non-consumers.**[50] Yoghurt consumption has been associated with higher socio-economic status, reduced sitting time and lower alcohol and fast food intake. In addition, people who regularly consume yoghurt tend to be more physically active and have more informed nutrition knowledge.[51,52]

Similar evidence has been shown for children aged 2-18 years, where frequent yoghurt consumption was associated with decreased energy derived from added sugar, and significantly greater consumption of whole fruit, whole grains and milk.[53]

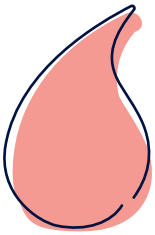


Weight

Most of the studies conducted on the effects of yoghurt and weight changes have shown beneficial effects, including lower incidence of overweight and obesity, specifically abdominal obesity and reduced waist circumference.[54-57] **While excessive free sugar intake has been linked with weight gain, a 2017 systematic review of prospective cohort studies showed yoghurt consumption is associated with reduced adiposity.**[58] These findings are consistent with studies conducted in children and adolescents that have found consumption of yoghurt (all types) was associated with lower body fat, lower risk for CVD, and higher cardiorespiratory fitness.[59]

More recent studies have provided additional information on the role of yoghurt in weight management. Mozaffarian et al. studied these relationships in three major American cohorts and found that yoghurt consumption reduced the risk of weight gain. The study also concluded that the consistent consumption of one serving of yoghurt per day showed a protective effect of up to 28 per cent in waist circumference when compared to those who did not consume yoghurt.[60] Furthermore, Wang et al. found that the **consumption of three or more servings of yoghurt per week was directly related to a 50 per cent lower risk of weight gain when compared to those who consumed less than one serving of yoghurt per week.**[61]

This effect may be explained by the protein in yoghurt which aids better appetite control and satiety compared to carbohydrate and fats.[54,55] The major proteins found in yoghurt are whey and casein, which play a part in metabolic regulation by stimulating several hormones that regulates food intake and glucose uptake.[56,57,59]



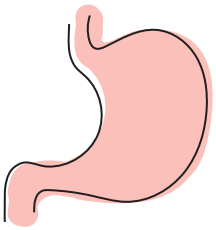
Diabetes

Many studies have found a significant negative association between yoghurt consumption and type-2 diabetes (T2D), and just one serve of 125g of yoghurt per week is associated with a 28 per cent decrease in risk of developing T2D.[63-69] According to a meta-analysis, **consumption of 80 to 125g/day of yoghurt per day (both plain and flavoured) resulted in a 14 per cent lower risk in developing T2D**[70]. This finding is in support of other studies, where results have found that all yoghurt types, regardless of fat and sugar content, have been generally associated with a decreased risk of diabetes.[63,68]

A prospective study with a follow-up period of ten years found women who consumed just two servings per week had an 18 per cent reduced risk of the incidence of T2D than those who consumed yoghurt less than once a month.[69] Notably, studies that investigated the long-term consumption of yoghurt found a stronger protective factor, with consumption over ten years leading to an average 24 per cent reduction in the risk of T2D.[64]

An interesting finding in some of these studies was a 40 to 47 per cent decreased risk of developing T2D when yoghurt was substituted for discretionary snack foods such as potato chips, biscuits and chocolate, which indicates that yoghurt is a good practical recommendation as a replacement for less healthy snack foods to reduce diabetes risk.[63,64,68]

The GI values of all yoghurt is generally low, partly due to the low GI of lactose (which is classified as low <55), as well as the protein content reducing the glycemic response.[62] Sweetened yoghurts had an average GI of 41. Therefore, even **flavoured yoghurts with added sugar are unlikely to have a negative impact on glucose control, in part due to yoghurt's high protein and low-GI lactose content**.



Gut health and digestion

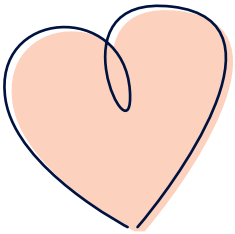
With the growing interest in diet and gut health, yoghurt and other fermented foods are being studied extensively to determine whether added probiotic bacteria can alter microbiome composition, and whether the production of short chain fatty acids via fermentation can lead to improved gut health.

The research is still emerging, but some studies have shown that the survival rates of some strains of probiotics (lactobacilli and bifidobacterial) may increase when consumed in dairy foods like yoghurt, as casein and fat may help to protect the bacteria as they pass through the upper digestive tract.[71,72]

To see a benefit on the gut microbiome, a key measure of its effectiveness is that the beneficial bacteria must be able to survive the transit through the gastrointestinal system. Studies have investigated the viability of probiotics added to yoghurt and fermented milk, reporting increased recovery of bacteria in fecal samples.[73,74] Another study demonstrated a slight increase in microbial diversity in some individuals after they ate yoghurt[75], while increases in beneficial gut bacteria (*Bifidobacteria* and *Lactobacilli*) have also been observed with several different types of probiotics.[76] Daily consumption of a probiotic yoghurt is also thought to decrease pathogens in the gut.[77] There are still knowledge gaps in relation to the way fermented dairy products might affect the composition of the intestinal microbiota and the specific health benefits of yoghurt on gut health.

Lactose intolerance

One area of yoghurt and gut health that is well established is digestion, in particular for individuals that suffer from lactose intolerance and associated symptoms. The lactose in yoghurt is digested more efficiently than other dairy sources of lactose because the bacteria inherent in yoghurt assist with its digestion.[78] **In studies using lactase-deficient individuals, all subjects were found to be free of symptoms after consuming varying amounts of either flavoured or unflavoured yoghurt.**[79] The lactase within the yoghurt fermenting bacteria survives the acidic conditions of the stomach, as it is physically protected within the bacterial cells, which is facilitated by the buffering capacity of yoghurt. The change in pH as the yoghurt enters the small intestine and a slower gastrointestinal transit time allows the bacterial lactase to be active, digesting the lactose in the yoghurt sufficiently to prevent symptoms in lactose intolerant people.[80]

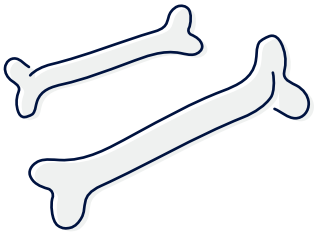


Heart health

Dairy saturated fatty acids have previously been suggested as one of the many factors that lead to an increased risk of CVD. However, emerging evidence indicates that not all fats have adverse effects on CVD health. Plasma phospholipid 15:0, a biomarker of dairy fat intake, showed inverse association with the incidence of CVD and CHD[81], and various cohort studies have found no association between dairy fat and increased risk of heart disease including stroke.[81,82] A meta-analysis by Wu and Sun found evidence for a protective relationship between consumption of yoghurt and heart disease.[83] **The Heart Foundation's recently updated position statement recommends regular-fat or reduced-fat dairy for the general population.**[42]

Fermented dairy foods (including yoghurt) have been promoted as functional foods that carry antihypertensive characteristics, with reduced-fat dairy appearing to exert a stronger effect on lowering the incidence of hypertension compared to regular-fat dairy.[84,85] In addition, following a healthy lifestyle exerts different mechanisms that may reduce the risk of hypertension and CVD. The most recent cross-sectional cohort study found that hypertensive consumers who had milk/yoghurt regularly (>7 servings/week) had healthier lifestyle choices compared to sporadic (<1 serving/week) consumers.[86]

Very few studies have directly evaluated the role of yoghurt on CVD. In a case-control study conducted in Italy, with a sample of 507 cases of myocardial infarction and 478 controls of both genders aged 25-79, it was observed that individuals who consumed yoghurt on a daily basis had a 45 per cent lower risk of myocardial infarction when compared to those who did not.[87]



Bone health

Yoghurt contains an abundance of essential nutrients important for bone growth and bone health, most notably calcium. The daily consumption of yoghurt has shown to reduce the risk of fractures and osteoporosis in older adults. In a cohort study, for every unit increase (i.e. increase of one serving per week) in yoghurt intake, there was a 31 per cent decreased risk in developing osteopenia and a 39 per cent decreased risk of being diagnosed as osteoporotic in females, as well as a 52 per cent decreased risk of osteoporosis in males.[88] Other studies showed a protective but non-significant association with high yoghurt intake [89,90]. A recent systematic review and meta-analysis found that in cohort studies, the intake of yoghurt and cheese was inversely associated with hip fracture risk, however due to the limited amount of case-control included in the review, results showed no overall association.[91]

SUMMARY

All types of yoghurt, including sweetened varieties, contain essential nutrients, such as protein, calcium, magnesium, potassium, phosphorous, zinc, vitamins A, B12, riboflavin, niacin and iodine. This unique matrix provides greater health benefits than could be gained from individual nutrients.

Yoghurt is a high calcium, nutrient dense food, and the addition of fruits, flavours and sugar improves the aroma, texture, colour and flavour of the products enhancing palatability and increasing average intakes.

Yoghurt only contributes 1.8% of total daily free sugar in the average Australian diet, compared to discretionary foods that contributed 81% of free sugar intakes.

The NSW Ministry of Health have found no evidence to suggest limiting nutritious foods in the diet that contain added sugar, including flavoured yoghurt.

Yoghurt has been shown to have positive health benefits for digestive health, decreased risk of obesity and diabetes and overall diet quality.

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